

Abstract

A system dynamically adjusts the delivery rate of a cryopreservation solution to red blood cells to permit freezing. The delivery rate is preferably determined according to an equation that maintains a linear change of red blood cell osmolarity over time so as to prevent osmolarity shock of the red blood cells. In the preferred embodiment, the system includes a controller that is preconfigured to automatically deliver the cryopreservation solution to the red blood cells in accordance with the equation. The system may also support the recovery of thawed red blood cells by diluting the red blood cells and washing them of the cryopreservative. Again, the system preferably adjusts the delivery rate of a dilution solution so as to prevent osmolarity shock of the red blood cells during the recovery phase. The recovered red blood cells may be suspended in a preservation solution to further increase their shelf-life following the recovery phase.